Family Provisioning Is Not the Only Reason Men Hunt

A Comment on Gurven and Hill

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Gurven and Hill (2009) ask, "Why do men hunt?" As they say, "The observation that men hunt and women gather supported the simplistic view of marriage as a cooperative enterprise. Greater sophistication suggests that males may often be motivated by mating and status rather than offspring investment" (p. 60). We agree (e.g., Hawkes 1990, 1991; Hawkes et al. 1991, 2001*a*, 2001*b*). This is the revision we first proposed nearly 20 years ago (Hawkes 1990) and have elaborated several times since. Having endorsed our point, Gurven and Hill then reject it, expressing continuing confidence in the idea that "men's food production efforts are mainly motivated by a concern for familial welfare" (p. 68). Their rejection of our argument and related reaffirmation of conventional wisdom stem from a misunderstanding of data from the Paraguayan Ache and Tanzanian Hadza and a failure to appreciate the importance of other sources of information. We elaborate this critique on four key points.

Dietary Importance of Men's Hunting

Gurven and Hill (2009:52–53) imply that our previous work inappropriately discounted the contribution of men's hunting to Ache and Hadza diets. On the contrary, we have repeatedly underscored its significance (e.g., for the Ache, Hawkes 1987, 1990, 1991 and Hawkes et al. 1982; for the Ache and other cases, Hawkes 1993 and Hawkes and Bird 2002; and for the Hadza, Hawkes et al. 1991, 1997, 2001*a*, 2001*b*). In the case of the Hadza, our data from a total of 256 days of observation (1985–1988) show that men's big-game hunting delivered an average of 0.7 kg/consumer/day (live weight) to the residents of camps we observed. We affirm that men's hunting is a major component of group subsistence in this and other cases, including the Ache.

Men's Hunting and Familial Welfare

Group-level averages are one thing; family provisioning is another. The question of men's foraging goals arose for the Ache when analysis of a large data set on food consumption during long-distance foraging treks revealed two things. First, some food types were more widely shared than others (Kaplan and Hill 1985), variation that was independent of the sex of the acquirer (Hawkes 1991). Second, men specialized in acquiring the foods for which the smallest fraction went to members of their own nuclear families (Hawkes 1990, 1991; Kaplan and Hill 1985). Quantitative analyses showed that Ache men would earn more for their own households by targeting a different suite of resources, focusing on those less widely shared, notably palm starch (Hawkes 1990, 1991; Hill et al. 1987). Something beyond family provisioning was needed to explain men's work.

Gurven and Hill (2009:52) now report new Ache data amending previous estimates of acquisition rates for palm starch and hunting. The revised figures are 850–1,200 (mean = 1,050) kcal/h for palm starch, 830 kcal/h for hunting. Since these numbers nearly overlap, Gurven and Hill conclude that our previous inference that men would earn higher overall rates by including palm starch in the resource array they routinely exploit is refuted. Yet, if the question is family provisioning, the distinction between acquisition rate and "take-home" fraction challenges that claim. The sharing data that Hill himself analyzed (Kaplan and Hill 1985) show that nuclear family members of the acquirer got 30% of the palm starch. Thus the family income rate was ~300 kcal/h. For items acquired by hunting, family members got 5%–11%, yielding a family income rate of 67–91 kcal/h (Kaplan and Hill 1985). Consistent attention to hunting, despite the opportunity costs, points to a concern for something other than family provisioning.

Gurven and Hill's focus on the overall average yield from big-game hunting among the Hadza similarly ignores issues related to the amount, value, and reliability of returns that actually reach the hunter's family. Attention to variance and distribution is not dismissal of the importance of hunting but reveals that concerns aside from family provisioning are needed to explain it. Over our 2,072 hunter-day observation record, individual Hadza men succeeded in acquiring a large animal carcass by hunting or scavenging on only 1 hunter-day in 30, a success rate of 3% (Hawkes et al. 1991, 2001*b*). For prey weighing <180 kg (ca. 68% of all recorded large carcasses taken), hunters' household share averaged just 5% of total meat weight; for larger prey (mainly zebra), it was roughly 10% (Hawkes et al. 2001*a*). Gurven and Hill (2009:53) remark on the nutritional importance of fat from these carcasses, yet African ungulates are notoriously lean. Moreover, easily processed sources of fat (bovid long-bone marrow, zebra head cavity contents) were frequently stripped out and eaten by hunters and members of the carrying party at the point of carcass acquisition, where members of the hunter's family were not consistently present, his younger children rarely so (O'Connell et al. 1988, 1990, 1992). Certain fat-rich organs were routinely reserved for consumption by adult men only. As it happened, hunters and their families *actually lost weight* in the single season where hunting success and related

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amounts of meat eating were unusually high (Hawkes et al. 1997), a finding that might have been predicted from knowledge of the cost of protein metabolism (e.g., Speth and Spielman 1983).

Other opportunities that might better serve hunters' household nutritional needs were certainly available. A small-game hunting and trapping experiment conducted with a subset of the same men noted above and spanning 102 hunter-days yielded a positive outcome on one of every three of those days (Hawkes et al. 1991). The experiment allowed us to use the prey model from foraging theory (Charnov 1976; Stephens and Krebs 1986) to determine whether hunters were maximizing their return rates by ignoring small animals. When the assumptions of that model are met, a hunter maximizes his mean rate of gain by pursuing all resources that have profitabilities higher than the average rate available from continuing to *search for and handle* higher-ranked prey. Profitability, here defined as the expected rate of gain after encounter, is the basis for ranking prey types. Because we were interested in family income rates, we calculated both the average rate for big-game hunting (which includes the time spent in search) and the profitability for small animals (which does not) by adjusting for the fraction expected to go to the hunter's household. Since family income profitabilities for small animals are higher than the overall family income rate for searching for and taking big game, hunters would increase their family income rate by taking small animals as well as large whenever they are encountered (Hawkes et al. 1991, 2001*b*).

Hunters in our 1985–1988 data set rarely pursued the small game they encountered on most of the 75 hunting trips we monitored via focal-person follows, and they never devoted more than 5 minutes or so to the effort, successful or not, before resuming the search for larger prey. As in the case of the Ache, consistent disregard of opportunities that would net higher family incomes does not support the notion that Hadza hunters' prey selection, distribution, and consumption patterns favor familial welfare.

Contingent Sharing?

Ache and Hadza both share meat widely. Along with others (notably Woodburn 1998), we have disputed the assumption that Hadza meat sharing is exchange. Not only the hunter but also many others pursue entitlement to the meat. As we said in 2001 (Hawkes et al. 2001*a*),

> Once a carcass was acquired, news spread quickly. The location of a carcass was pinpointed by word of mouth and also by circling vultures and, at night, the call of lions and hyenas. Not only those tracking the animal but often other men, women, and children converged on a kill site (O'Connell et al. 1988, p. 117).
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> The style of interaction at kill sites exemplifies what Peterson (1993) called "demand sharing." Arguments over shares and share size are not uncommon; claims often take the form, "Where's mine?" . . . Instead of a set of exchanges with the hunter, the process of distribution is more like appropriation from the public domain. . . . The style contrasts, for example, with the manners evident among the Ache . . . who are generally much more soft-spoken. . . . Food sharing *etiquette* is strikingly different in the two cases. But some features of the distribution process are similar. Not only is meat very widely shared among the Ache . . . with no bias in the shares to better hunters or their wives and children; but, as with the Hadza, hunters play no role in meat distributions (Hill and Kaplan 1988, Kaplan et al. 1990). Usually an older Ache man takes on the final carving of cooked meat, and all watch as he distributes shares. Observers frequently criticize portion size and call for adjustments. Once others know of a hunter's kill, he is in no position to choose who gets meat or how much (p. 131).

Gurven and Hill (2009:53–54) dispute our assessment:

> A recent comprehensive review shows little support for the notion that hunters do not (or cannot) influence resource distributions or that meat is unconditionally shared (Gurven 2004). Empirical evidence does not support the assertion that hunted prey are undefendable public goods. . . . Indeed, a hunter's nuclear family obtains more from his kill than do other families in all sharing studies except those among the Ache during forest treks.

Gurven and Hill note (2009:54) that our Hadza analysis reports "no relationship between the total amount of meat a hunter provides to all others and the amounts received in return from all others, but this does not test contingency. . . . Our reanalysis does show significant contingency for meat transfers among pairs of Hadza hunters" (Gurven 2004).

On the contrary, Gurven's reanalysis does *not* demonstrate that men get shares in exchange for shares they have given to other men. The correlation he reports is due to two variables: some men were observed more often both as claimants and as successful hunters; some men have higher overall hunting success rates. As to the first of these, our observation window changed as study camps moved and as people arrived or left particular camps. Men were observed intermittently, some on more days than others. Men observed over more days were more likely to be recorded making a kill. They were also more likely to be observed getting a share from another's kill. A correlation between dyads in the amount of meat each took from kills of the other emerges *entirely from observation bias*. We discussed the analytical problem at the time and noted that changing camp compositions are an inherent feature of Hadza life. This is one of the reasons that exchange notions are poorly suited to explain the distributions of meat (Hawkes et al. 2001*a*:132–133):

> We have focused on the hypothesis that hunters are exchanging meat-now for meat-later because it underlies the long held notion that the risky business of hunting supplies the basic motivation for human social interdependence (e.g.,

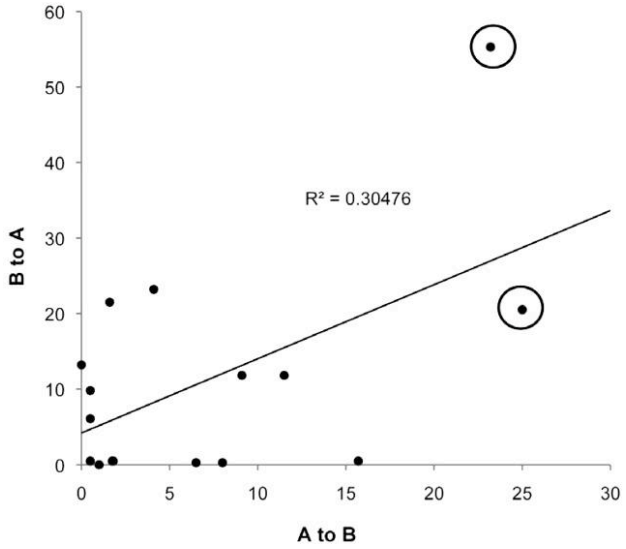

Figure 1. Reanalysis of Hadza household meat shares reported in Hawkes et al. (2001*a*) similar to that of Gurven (2004). Units are the total kilograms of meat that arrived at one man's household from kills of another man in the sample of large-animal kills for which we weighed all household shares. The positive correlation depends on the circled points (see text).

Cosmides and Tooby, 1992). That is the hypothesis that gives rise to the characterization of hunters "storing meat in the bellies of their neighbors" (e.g., Pinker, 1997). Hypotheses other than meat-for-meat exchanges have also been suggested. Hunters might, for example, trade shares for other goods and services (Kaplan and Hill, 1985; Winterhalder, 1986). The property rights question [that we count against exchange assumptions] is (perhaps usefully) assumed away in this hypothesis. Formidable accounting problems remain. Ever-changing scores in different currencies, not all readily divisible, require daunting feats of coordinated calibration. And, as laid out by Trivers (1971), self-interested actors should often have conflicting views of who is in arrears to whom and how much.

Figure 1 shows an analysis of our Hadza household meat share sample similar to the one Gurven (2004) reported. For pairs to be eligible for this analysis, each member must have been present when the other killed a big animal, so only a subset of pairs can be used for this test (a constraint that Gurven did not apply). The positive correlation for the 15 relevant pairs depends entirely on the two circled points, especially the high outlier in the upper right corner of the figure and also the point below it and just to the right. Each of the two pairs includes the man we most often camped with (127 days), more than half again as many days as any other man. The other pair members are the two men whose big-animal success rates measured as prey/day during our 1985–1986 observations were by far the highest, both 0.12/prey/day compared to 0.07 prey/day for the man with the next highest success rate. To assess Gurven's (2004) claim, repeated here by Gurven and Hill's (2009) contention that the correlation indicates contingent transfers (men getting shares in return for shares given), we analyze some simple models to further clarify the biases and then return to the observations themselves.

Figure 2 shows that just a difference in the number of days observed can result in a perfect correlation between the transfers from one man's kills to the other and their reciprocal. In the model detailed in the associated table, there is no exchange. All resident men claim equal shares from the kills of other men. How often A is observed to claim a share from

I	II	III	IV
Hunter	Fraction of days in observation camp	Success rate	Chance of success on day in observation camp
1	1	0.1	0.1
2	0.8	0.1	0.08
3	0.6	0.1	0.06
4	0.4	0.1	0.04
5	0.2	0.1	0.02

V	VI	VII	VIII
Hunter A	Hunter B	A gets shares from B (B kills, A is present)	B gets shares from A (A kills, B is present)
1	2	0.08	0.08
1	3	0.06	0.06
1	4	0.04	0.04
1	5	0.02	0.02
2	3	0.048	0.048
2	4	0.032	0.032
2	5	0.016	0.016
3	4	0.024	0.024
3	5	0.012	0.012
4	5	0.008	0.008

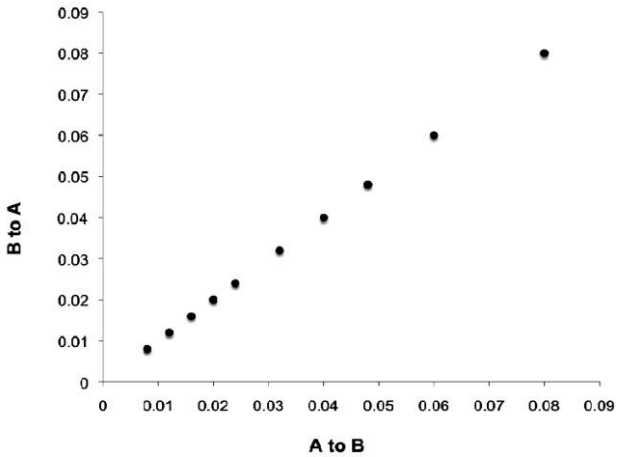

Figure 2. Deterministic model showing the correlation between the shares that hunter A gets from the kills of hunter B and those that B gets from the kills of A. All residents are assumed to take equal shares and to have the same success rate. They differ only in their probability of residence in the observation camp. The perfect correlation is entirely due to that observation bias, not repayment or contingent sharing.

B depends on how often B is in the observation camp and procures a large carcass with A also present. In the upper panel of the table, column I identifies five hunters. Column II lists the fraction of days each is resident in the observation camp. Their success rates, column III, are assumed to be the same. The product of a hunter's success rate (col. III) and the fraction of days he is observed (col. II) is the frequency of kills he gets while resident in the observation camp, column IV. In the lower panel, columns V and VI identify the hunters playing A and B in each pair. Column VII is the chance that B kills while residing in the camp (col. IV entry for the hunter playing B) times the chance that A is also resident (col. II entry for the hunter playing A). Column VIII is the value calculated for A's kills while resident times the chance that B is present. The figure plots the correlation between the frequency of shares that A gets from the kills of B (col. VII) with the frequency of shares that B gets from the kills of A (col. IX). It would be an error to read this perfect correlation as evidence of contingency.

The model in figure 3 also assumes no exchange. Men claim equal shares from every kill. In this case there is no difference in the chance that hunters are observed, but hunters differ in their success rates. Column I lists the hunters, column II their success rates, and column III the pairs (which hunter plays A, which plays B). The frequency of B's shares from the kills of A depends on the frequency of A's kills, and the frequency of A's shares from the kills of B depends on the frequency of B's kills. Column IV lists the former (the entry for A in col. II); column V lists the latter (the entry for B in col. II). The figure plots the relationship between columns IV and V. Here the correlation is far from perfect but still strong—stronger than the correlation that Gurven (2004) reported for his reanalysis of our Hadza data. Again, it would be an error to assume the correlation is evidence of contingency.

The simple deterministic models of figures 2 and 3 do not allow for stochastic variation, so we created simulations in which both the frequency of observations and the rates of hunting success were randomly drawn from distributions designed to approximate the observed values. The models accounted for the amount of meat that B took from the kills of A as a function of the number of days each individual was observed, the hunters' respective success rates, and/or the amount of meat that A took from kills of B. We compared the goodness of fit of 10 single and multivariate models using the Akaike Information Criterion (AIC; Akaike 1974). The fit of models including days of observation and success rates were consistently highly ranked, showing that even when random variation is added, these biases remain.

After comparing the models with simulated data, we compared (again via AIC) how well a similar set of models fit the observed data. When we kept the extreme outlier in the upper right-hand corner of figure 1, models that included a variable for kilograms of meat that A took from kills by B fit better than those that did not. After removing the outlier, the best-fitting models predicted the amount of meat taken by B from A's kills as a function of days observed. These models did not include a variable for amount A took from B's kills.

I		II
Hunter		success rate
1		0.15
2		0.13
3		0.11
4		0.09
5		0.07

III	IV	V
A B	A to B	B to A
1 2	0.15	0.13
1 3	0.15	0.11
1 4	0.15	0.09
1 5	0.15	0.07
2 3	0.13	0.11
2 4	0.13	0.09
2 5	0.13	0.07
3 4	0.11	0.09
3 5	0.11	0.07
4 5	0.09	0.07

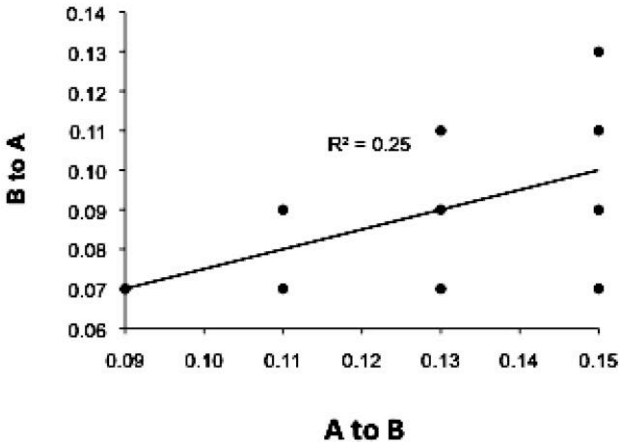

Figure 3. Deterministic model showing the correlation between shares that hunter A gets from the kills of hunter B and those that B gets from the kills of A. As in figure 2, resident hunters are assumed to take equal shares. In this case they do not differ in their frequency of days in the observation camp; they differ only in their success rates. As in figure 2, the substantial correlation is not due to repayment or contingent sharing.

The deterministic models, the stochastic simulations, and the models fit to the observed data are further evidence against Gurven's (2004) claim, repeated by Gurven and Hill (2009), that Hadza meat sharing is exchange. The models caution against the assumption that pairwise correlations are, by themselves, evidence of contingent sharing.

What's the Question?

Gurven and Hill are clearly of two minds about the goal(s) of men's hunting, affirming in some places their continuing confidence in the idea that men's hunting is family provisioning and elsewhere conceding that other considerations, mating and status among them, may sometimes be more important. Data for Ache in the forest and Hadza data reported so far exemplify the latter, as do other data sets that Gurven and Hill scarcely mention, notably those by Bird and Bliege Bird (2010), Bliege Bird (1999, 2007), and Bliege Bird and Bird (2008), as well others discussed by Hawkes and Bliege Bird (2002).

We agree that interpretations and analyses should always be carefully scrutinized. In spite of our longstanding skepticism about claims of contingent sharing (reinforced by consideration of Gurven's [2004] analysis of our Hadza data), the burden of evidence so far suggests variation in men's hunting goals among and within ethnographic cases. Goals for Ache men may differ between the forest and the settlement. They may differ situationally for Hadza men as well. In Hadza meat-sharing data collected recently by Wood and Marlowe (2007), 45% of the meat from large game went to the hunter's family, an average that is more than the single largest share (39%) to a hunter's own family in our sample. Our household sharing sample is small. Wood's observations will greatly expand the Hadza data set, perhaps allowing tests of hypotheses about variation in prey size, camp size, frequency and timing of kills, or other ecological variables that might explain the difference.

We agree with Gurven and Hill's (2009:53) observation that "research is needed to determine how often men pursue foraging strategies that are suboptimal for familial provisioning" and welcome their help toward recognizing and explaining the variation. Rather than assuming only one goal to be the real one and discounting or ignoring data that challenge it, we should be primed by both theoretical and empirical work to expect tension among men's foraging goals, with the emphasis changing as trade-offs vary. Explaining the variability should be the task at hand.

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